

YARRA RANGES SHIRE COUNCIL

DECEMBER 2019

WARBURTON MOUNTAIN BIKE DESTINATION

QUALITATIVE
ENVIRONMENTAL RISK
ASSESSMENT

wsp



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Warburton Mountain Bike Destination Qualitative Environmental Risk Assessment

Yarra Ranges Shire Council

WSP





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REV	DATE	DETAILS
A	16/08/2019	Rev A for client review
B	08/11/2019	Final
C	12/12/2019	Final incorporating client comments

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ABBREVIATIONS

ALARP	As Low As Reasonably Practicable
CEMP	Construction Environmental Management Plan
CHMP	Cultural Heritage Management Plan
EES	Environment Effects Statement
ERA	Environmental Risk Assessment
IMBA	International Mountain Bike Association
WMBD	Warburton Mountain Bike Destination
YRSC	Yarra Ranges Shire Council

EXECUTIVE SUMMARY

The Warburton Mountain Bike Destination (WMBD) is a proposed world class mountain biking destination centered around Warburton, approximately 70 km north east of Melbourne. It consists of approximately 186 km of mountain bike trails providing both downhill and cross-country style trails.

Yarra Ranges Shire Council (YRSC) has identified mountain biking as an opportunity for tourism growth within this region which would also support the economy of the township and the health and well-being of its residents. It seeks to create iconic trails eligible for International Mountain Bike Association (IMBA) Epic Trail status which would position Warburton as an internationally significant mountain bike destination.

YRSC has engaged WSP to undertake a qualitative Environmental Risk Assessment (ERA) for the proposed WMBD project to help to inform the Environment Effects Statement (EES) referral documentation. This report details the ERA framework and tools used to conduct the risk assessment and the outcomes of the ERA.

The ERA draws on the findings of environmental, social and heritage assessments conducted to date on the project.

A total of 39 potential environmental risks were identified and assessed for the project. 10 Medium residual risks are expected to remain after the application of appropriate and effective mitigation measures with the remainder being low or negligible. There were no residual High or Extreme risks.

Key Medium residual risks were associated with Biodiversity (11) and Social (1). These related to potential risks to public safety, including from construction activities, bushfires and use of the trail, and impacts on Leadbeater's Possum and Cool Temperate Rainforest.

The Medium residual risks will be managed through world class design in accordance with the International Mountain Bicycling Association's *Guidelines for a Quality Trail Experience* (2017) and relevant management plans and project environmental protocols to minimise risks to environmental matters from the project.

The outcomes of the ERA indicate that the mitigation measures being implemented by the YRSC will reduce risks to environmental aspects associated with the project.

1 PROJECT BACKGROUND

Yarra Ranges Shire Council (YRSC) has engaged WSP to undertake a qualitative Environmental Risk Assessment (ERA) for the proposed Warburton Mountain Bike Destination (WMBD) project to help to inform the Environment Effects Statement (EES) referral documentation. This report will detail the ERA framework and tools used to conduct the risk assessment and the outcomes of the ERA.

The ERA draws on the findings of environmental, social and heritage assessments conducted to date on the project.

1.1 PROJECT DESCRIPTION

The WMBD is a proposed world class mountain biking destination centered around Warburton, approximately 70 km north east of Melbourne. A significant informal network of mountain bike trails has developed over time within the region and there is evidence of increasing usage of these trails by local and visiting riders. Mountain biking in this locality started around 15 years ago and was concentrated on a route from Mount Tugwell to Imuka Road near the La La Falls car park.

YRSC has identified mountain biking as an opportunity for tourism growth within this region which would also support the township and the health and well-being of its residents. It seeks to create iconic trails eligible for International Mountain Bike Association (IMBA) Epic Trail status which would position Warburton as an internationally significant mountain bike destination.

The WMBD project is proposed as a ski style resort with visitors able to access world class trails directly from their accommodation, or parking facilities in town. It consists of approximately 186 km of mountain bike trails providing both downhill and cross-country style trails. Figure 1.1 details their respective geographical locations.

2 RISK ASSESSMENT FRAMEWORK

A qualitative environmental risk assessment (ERA) was undertaken to identify potential environmental impacts and environmental risks of the construction and operation of the WMBD.

The purpose of the ERA is to provide a systematic approach to identifying and assessing the potential environmental risks arising from the project, including social, heritage or economic risks. The ERA articulates the probability of an incident with potential environmental effects occurring and the consequential impact to the environment.

A risk register was established to capture the findings of the risk assessment process. The register details the potential environmental impacts identified, the potential consequences, the mitigation measures proposed to reduce the risk including mandated or industry standard controls fundamental to the project, and a residual risk rating.

2.1 ENVIRONMENTAL IMPACT AND RISK ASSESSMENT METHODOLOGY

2.1.1 ENVIRONMENTAL IMPACT ASSESSMENT

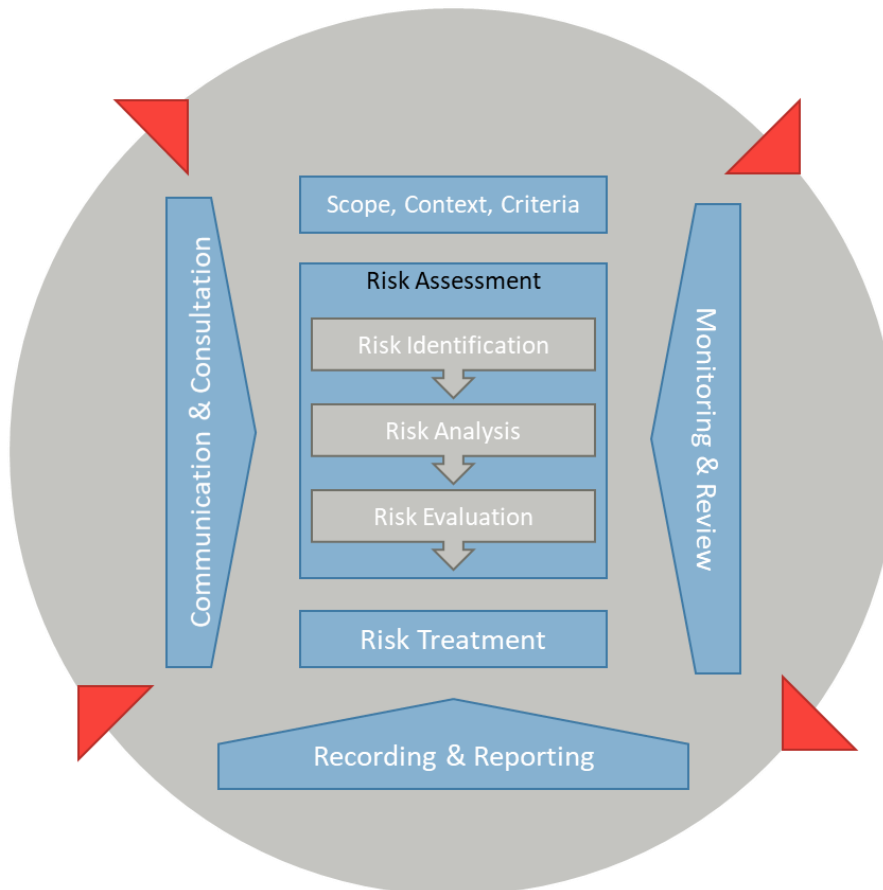
An environmental impact is any change to the environment that is planned as part of the activity. These can be classified as ‘direct’ impacts, for example damage to Leadbeater Possum habitat from the construction of the trails, or ‘indirect’ impacts, such as increased light and noise from the activity disturbing terrestrial fauna.

A number of assessments have been undertaken for the project and were used to inform the ERA. These included:

- Warburton Mountain Bike Trails: Historic Survey Report [Draft], Biosis, 2019.
- Warburton Mountain Bike Destination: Community Engagement Report April-October 2018, Yarra Ranges Council, 2018.
- Warburton Mountain Bike Destination: Community Engagement Strategy, Yarra Ranges Council, 2019.
- Warburton Mountain Bike Hub Master Plan: Cultural Heritage Management Plan 15276 [Draft], Biosis, 2019.
- Warburton Mountain Bike Destination: Revised Economic Impact Assessment, TRC Tourist Pty Ltd, 2018.
- Local Movement and Transport Report: Warburton and Surrounds, SALT³, 2019.
- Warburton Mountain Bike Destination: Traffic Impact Assessment, SALT³, 2019.
- Warburton Mountain Bike Destination: Bushfire Emergency Management Plan [Draft], Practical Ecology, 2019.
- Warburton Mountain Bike Destination: Health and Social Impacts Assessment, RMCG, 2018.
- Proposed Warburton Mountain Bike Destination: Biodiversity Impact Assessment [Draft], Practical Ecology, 2019.
- Warburton Mountain Bike Destination: Preliminary Surface Water and Geotechnical Assessment [Draft], GHD Pty Ltd, 2019.
- Warburton Mountain Bike Destination: Preliminary Landscape and Visual Impact Assessment [Draft], GHD Pty Ltd, 2019.
- Warburton Mountain Bike Destination Qualitative Air Quality Assessment, WSP 2019.
- Warburton Mountain Bike Destination Qualitative Noise Assessment, WSP 2019.

2.1.2 ENVIRONMENTAL RISK ASSESSMENT

An environmental risk is where there is potential for a negative environmental impact to occur, but where control and mitigation measures may reduce the extent or likelihood of the impact occurring. An ERA was undertaken for the WMBD project, in accordance with the principles outlined in the Australian Standard AS/NZS ISO 31000:2018 Risk Management and HB203:2012 Managing environment-related risk.



(Source: ISO 31000:2018)

Figure 2.1 Environmental risk management process

The ERA adopts the following definitions proposed by the Ministerial Guidelines for Assessment of Environmental Effects Under the Environment Effects Act 1978 (Department of Sustainability and Environment, 2006):

— Environment:

“It includes the physical, biological, heritage, cultural, social, health, safety and economic aspects of human surroundings, including the wider ecological and physical systems within which humans live”.

— Environmental risk:

“Environmental risk reflects the potential for negative change, injury or loss with respect to environmental assets”.

This correlates with ISO 31000: 2018, which defines risk as:

“the effect of uncertainty on [environmental] objectives”.

Both definitions reflect the fact that risk is normally expressed in terms of the likelihood of a change occurring and the consequence of that change.

To demonstrate that risks are As Low As Reasonably Practicable (ALARP) and acceptable, all management measures have been considered and, where these measures are practicable, they have been included. The assessment criteria and risk matrix applied to the risk assessment are discussed below.

2.1.2.1 RISK IDENTIFICATION

To effectively and comprehensively recognise all potential risks to the Project, it is necessary to identify potential hazards and environmental receptors associated with the project activities. This was undertaken by identifying the cause and effect pathway or relationship that exists between an activity and an element of the environment. It describes how aspects of Project construction, operation and maintenance interact with assets, values and uses.

This was completed systematically for each key environmental aspect (e.g. biodiversity, noise, historic heritage, etc.) and allowed the identification and categorisation of risks across each activity and environmental aspect of the Project.

The identification of impact pathways relies on an understanding of the existing environment, as defined by the specialist studies and an understanding of the WMBD project activities.

2.1.2.2 MITIGATION MEASURES

Risk mitigation measures are controls that are intended to avoid, remedy or mitigate the risk of environmental impact. This includes developing the design and construction methodology to avoid impact, mitigation measures to reduce severity or remedial action to rectify a consequence after an impact has occurred.

There are two categories of mitigation measures and controls. Planned controls are those base level controls inherent in the design, standards, legislation and policy, while additional measures are those controls over and above minimal inherent requirements (planned controls) proposed to reduce the raw risk to ALARP or to an acceptable residual risk level.

The assessment of residual risk was conducted on the basis that all applicable design standards, State and Federal legislation, regulations and policies would be complied with throughout the construction and operation of the project to reduce risk to ALARP.

ENVIRONMENTAL PROTOCOLS

The project has developed a series of environmental protocols in consultation with land managers to provide direction for the design and construction of the project to ensure environmental values are protected and impact minimised.

The protocols include two levels of management. The 'protocols', are the ultimate standard the project aims to achieve in the construction and operation of the project. However, acknowledging that not all standards will be realistic throughout the landscape, 'mitigation measures' have also been developed as a minimum requirement.

When conducting the risk assessment, we must assume that all mitigation measures considered in the assessment are in place and working effectively, to that end and for the purpose of this risk assessment only the mitigation measures and non-negotiable protocols have been considered in the risk assessment.

More information on the Environmental Protocols can be found in Section 4. The Environmental Protocols have been included in Appendix B.

2.1.2.3 RISK ANALYSIS

The assessment of environmental risk is a product of the possible consequence of an impact and the likelihood of that consequence occurring, both without controls (Raw Risk) and then with controls and mitigation measures in place and working appropriately (Residual Risk). There are several tools used in assigning appropriate consequence and likelihood categories in the risk assessment process. These are detailed below.

LIKELIHOOD/CERTAINTY OF RISK

Likelihood is defined as 'the chance of something happening' (ISO 31000:2018). Likelihood is determined by available evidence, previous experience and professional judgement. Table 2.1 outlines the definitions used for likelihood for the works.

Table 2.1 Risk assessment criteria – Qualitative measures of likelihood

DESCRIPTOR	DEFINITION
Almost certain (AC)	Expected to occur in the course of most normal circumstances
Likely (L)	Could occur in the course of most normal circumstances
Possible (P)	May occur in the course of normal circumstances
Unlikely (U)	Is possible, but not likely to occur in the course of normal circumstances
Rare (R)	Would only occur in exceptional circumstances

CONSEQUENCE/SIGNIFICANCE OF IMPACTS

By definition, consequence is ‘the outcome of an event affecting objectives’ (AS/NZS/ISO 31000:2018).

Consequence is informed by several factors, including:

- spatial extent – local (works site and nearby surrounding areas)
- duration – short-term, medium-term, or long-term; and
- nature – whether an impact is:
 - reversible or irreversible
 - direct, indirect or cumulative; or
 - positive, negative or neutral.

Assessment of the consequence of an impact may be informed by some of the above factors, with assessments based on available evidence, previous experience and professional judgement. The criteria used to guide the selection of a consequence category of an activity is provided in Table 2.2.

Table 2.2 Risk assessment criteria – Consequence of impact

DESCRIPTOR	CRITERIA
Insignificant (N)	<p>No detectable changes or very short-term, isolated/localised and readily reversible (insignificant) impact (<1 year for recovery).</p> <p>No impact to native vegetation or habitat.</p> <p>Resilient or highly disturbed receiving environment/population.</p> <p>No impact to Cool Temperate Rainforest, Mount Donna Buang Stonefly or Leadbeater’s Possum.</p> <p>Heritage: No observable impact to heritage, sites remain intact and unaffected.</p> <p>Social: No measurable impact to local character, amenity and access to public space/facilities.</p> <p>General community support, no impact to economy.</p>
Minor (Mi)	<p>Short-term isolated/localised detectable changes.</p> <p>Impact likely to be readily reversible (within 5 years for recovery).</p> <p>Resilient or disturbed receiving environment/population.</p> <p>No impacts on critical habitats such as Cool Temperate Rainforest, Mount Donna Buang Stonefly or Leadbeater’s Possum.</p> <p>Heritage: Minor disturbance or minor observable impact to locally significant heritage. No impact to state or nationally significant heritage.</p> <p>Social: Minor impact to local character, amenity and access to public space/facilities.</p> <p>Individual opposition to project, short term isolated economic issues.</p>

DESCRIPTOR	CRITERIA
Moderate (Mo)	<p>Short-term localised detectable changes.</p> <p>Impact likely to be medium-term and reversible (5–10 years for recovery).</p> <p>Short-term, reversible and localised impacts on critical habitats such as Cool Temperate Rainforest, Mount Donna Buang Stonefly or Leadbeater's Possum.</p> <p>Heritage: Moderate impact to heritage of state and/or local significance.</p> <p>Social: Moderate impact to local character, amenity and access to public space/facilities, some community resistance, economic pressure on community.</p>
Major (Ma)	<p>Impact likely to be medium to long-term and potentially irreversible (> 10 years to recover).</p> <p>Long-term detectable changes that are significant in the study area,</p> <p>OR</p> <p>Short-term detectable changes that are significant regionally.</p> <p>Sensitive receiving environment/population.</p> <p>Impacts on critical habitats such as Cool Temperate Rainforest, Mount Donna Buang Stonefly or Leadbeater's Possum.</p> <p>Heritage: Major impact to heritage of state and/or local significance.</p> <p>Social: Major impact to local character, amenity and access to public space/facilities. Vocal community conflict, declining economic stability.</p>
Catastrophic (C)	<p>Impact likely to be long-term and irreversible.</p> <p>Regionally significant changes.</p> <p>Highly sensitive receiving environment/population.</p> <p>Significant impacts on critical habitats such as Cool Temperate Rainforest, Mount Donna Buang Stonefly or Leadbeater's Possum.</p> <p>Heritage: Significant destruction of heritage, loss of value as heritage.</p> <p>Social: Significant impact to local character, amenity and access to public space/facilities. Public backlash, economic distress.</p>

The risk assessment criteria to be used for determining the significance of risks from the project, are a product of likelihood and consequences factors for activity-related environmental risks (refer to Table 2.3 below).

Table 2.3 Qualitative risk analysis matrix – Level of risk

			LIKELIHOOD				
CONSEQUENCE	Risk Categories		Rare (A)	Unlikely (B)	Possible (C)	Likely (D)	Almost Certain (E)
	Catastrophic	5	Medium	High	High	Extreme	Extreme
	Major	4	Medium	Medium	High	High	Extreme
	Moderate	3	Low	Medium	Medium	High	High
	Minor	2	Negligible	Low	Low	Medium	Medium
	Insignificant	1	Negligible	Negligible	Negligible	Low	Low

3 RISK ASSESSMENT OUTCOMES

The qualitative ERA process culminated in the development of the risk register which details the environmental risks identified for the project, along with any relevant standards, policies or inherent mitigation measures and the raw and residual risk rating of each risk. The final WMBD ERA register is provided in Appendix A.

This section provides an overview of the final risk register, presenting a breakdown of the identified environmental risks and the outcomes of the risk assessment process. More detailed information on key risks and mitigation measures relevant to each discipline is contained in Section 4 and in the impact assessment reports.

The review of relevant environmental assessments identified a total of 39 risks across 12 environmental aspect areas.

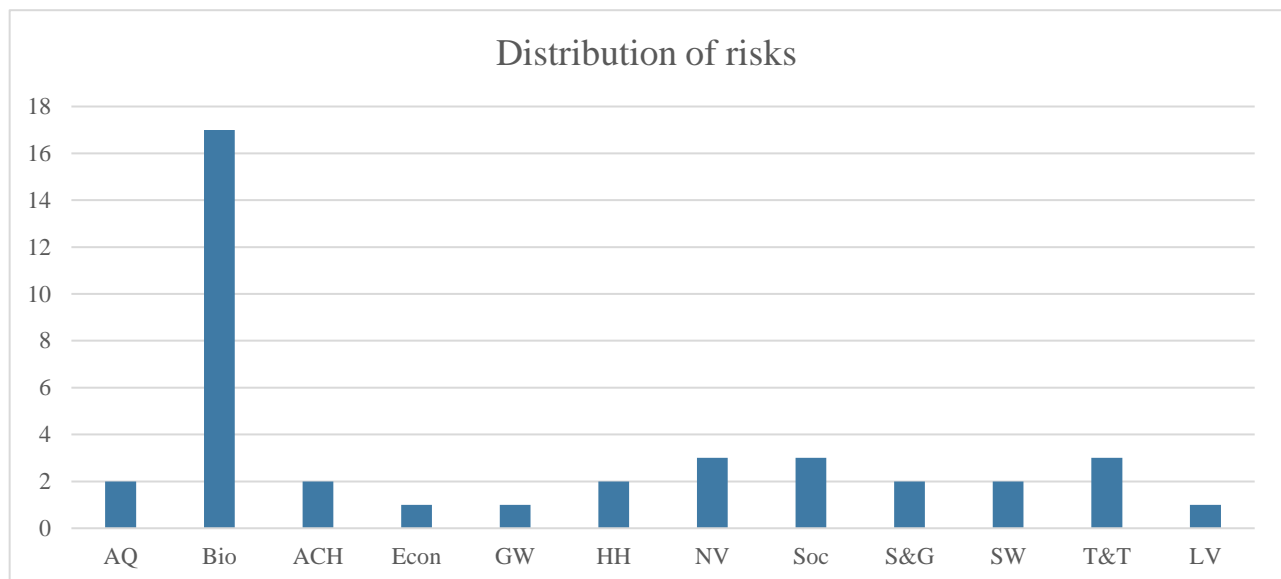


Table Definitions: Air Quality (AQ), Biodiversity (Bio), Economics (Econ), Aboriginal Cultural Heritage (ACH), Groundwater (GW), Historical Heritage (HH), Noise and Vibration (NV), Social (Soc), Surface Water (SW), Traffic and Transport (T&T), Landscape and Visual (LV).

Figure 3.1 Distribution of risks across each environment aspect

As expected, Biodiversity returned the greatest number of individual risks with a total of 17 risks identified. These were predominantly related to potential impacts to Leadbeater's Possum, Mount Donna Buang Wingless Stonefly and Cool Temperate Rainforest.

Three risks were identified each for Noise and Vibration, Social and Traffic and Transport, relating to impacts to public safety, amenity, land access and congestion.

Two risks were identified for each of Historic and Aboriginal cultural heritage as well as for Air Quality, Surface water and Soils and Geology. These were associated with impacts to waterways including flow and water quality, land instability, impacts to matters of heritage and dust and vehicle emissions.

A single risk was identified for Groundwater – potential for groundwater contamination from construction activities, for Economics – potential for negative impact on the town of Warburton, and for Visual and Landscape – potential impacts on visual and landscape amenity.

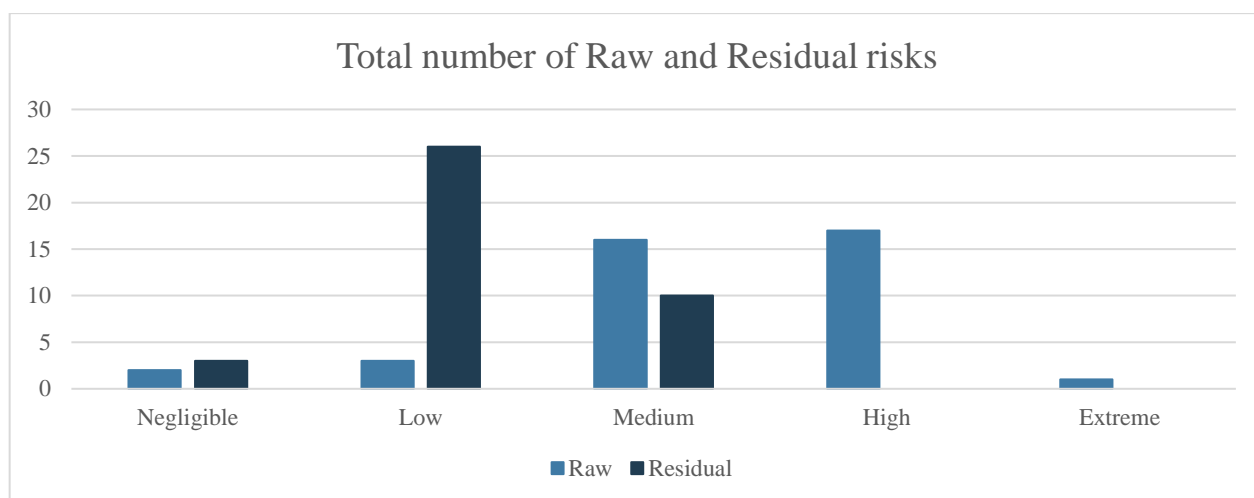


Figure 3.2 Distribution of raw and residual risks

The figure above shows the distribution of rankings across raw and residual risks. There was one Extreme raw risk identified in the ERA associated with unmitigated impacts to Cool Temperate Rainforest. There were 17 High and 16 Medium raw risks identified during the ERA, these were spread across the majority of environmental aspects. With mitigation measures in place, these were reduced to medium or lower residual risk, with no High or Extreme residual risks. The 10 residual Medium risks were associated with Biodiversity (9) and Social (1), with 29 risks being reduced to Low or Negligible with mitigation measures in place.

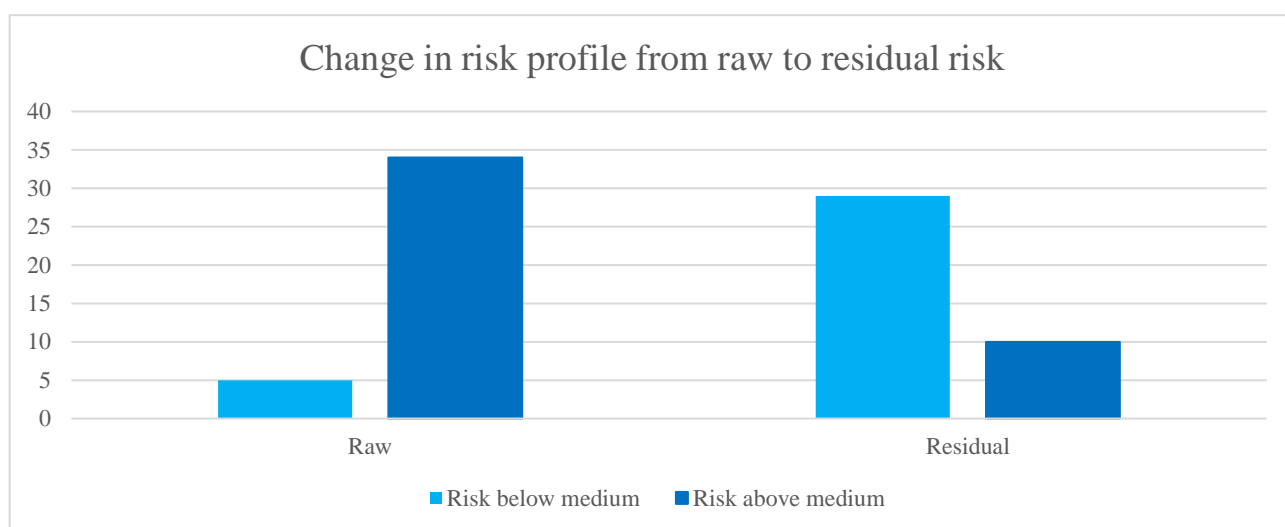


Figure 3.3 Change in risk profile from raw to residual risks

Figure 3.3 shows the change in risk profile before and after mitigation measures are applied. The risk assessment process resulted in the majority of environmental risks being lowered to an acceptable or manageable level with the 34 Medium or Higher raw risks being reduced to 10 Medium, 26 Low and three Negligible residual risks. There were no High or Extreme residual risks associated with the project. These 10 Medium risks will be managed through the appropriate management plans.

4 MITIGATION MEASURES

The basis of the assessment of the residual risk is the identification of management or mitigation measures and the assumption that those will be in place and functioning effectively during the design, construction and operation of the project. The mitigation measures or design responses identified in the ERA can be seen in more detail in the ERA in Appendix A. Below discusses at a high level the key plans and processes under which the mitigation measures will be implemented, managed and reported on.

DESIGN

The project will be designed with reference to the International Mountain Bicycling Association's, Guidelines for a Quality Trail Experience 2017 which provides guidance and establishes best management practices for the design and management of mountain bike trails. It utilizes existing approaches to protecting natural resources while developing new guidance to design, plan, and manage high-quality mountain biking trails.

The alignment and design of the project has been undertaken with the aim to avoid or minimise impact to the environment to the greatest extent practicable. The alignments of the trails have been changed and additional requirements included in the construction methodology to achieve this goal.

CONSTRUCTION METHODOLOGY AND ENVIRONMENT PROTOCOLS

A series of environmental protocols have been developed in consultation with land managers including DELWP and Parks Victoria to provide guidance for the design and construction of the project to ensure environmental values are protected and impact minimised. The protocols include standards to be met by the design and during construction, such as exclusion zones around nest boxes, hand construction only within 10m of a Myrtle Beech Tree and requirements for waterway crossings.

These protocols were developed in conjunction with species experts for Cool Temperate Rainforest, Leadbeater's Possum and Mt Donna Buang Wingless Stonefly and are the combined work of the following organisations:

- Yarra Ranges Council
- Department of Environment, Land, Water and Planning (DELWP)
- Parks Victoria
- Practical Ecology
- World Trail.

The protocols include two levels of management. The 'protocols', which are the ultimate standard the project aims to achieve in the construction and operation of the project. However, it is acknowledged that not all standards will be realistic throughout the landscape and 'mitigation measures' have been developed to minimise the impact to the values in these cases. There are some standards where no mitigation measures have been described and in these cases, the risk to the value is considered so high, that the protocol must be implemented.

CULTURAL HERITAGE MANAGEMENT PLAN

A Cultural Heritage Management Plan (CHMP) is a report prepared by a qualified Heritage Adviser which details the potential impact of a proposed activity on Aboriginal cultural heritage. It outlines measures to be taken before, during and after an activity in order to manage and protect Aboriginal cultural heritage in the activity area. The CHMP will also include a contingency plan which must be followed should Aboriginal cultural heritage materials be encountered by the project.

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

The Construction Environmental Management Plan (CEMP) outlines how the construction of the project will avoid, minimise or mitigate effects on the environment and surrounding area. It will describe in detail all the mitigation measures that will be employed during the construction of the project and will define the details of who, what, where and when those environmental mitigation measures are to be implemented. It will consider the requirements and details in the above-mentioned plans and processes to ensure consistent approach across the project to ensure the project avoids, minimises and mitigates any environmental impacts from the project.

TRAIL OPERATIONS PLAN

The Operations Management Plan provides a clear framework for the management, operation and maintenance of the proposed WMBD. It outlines the strategies for the protection and management of values of the trail including safety, heritage and environmental aspects and details the monitoring, reporting and evaluation requirements for the plan. The Trail Operations Plan is also the overarching document which details the specific aspect management plans over which it governs including the weed management and bushfire management plans.

5 CONCLUSIONS

The qualitative ERA undertaken for the project was based on a review of the documents supplied by Yarra Ranges Shire Council. This review allowed for the identification of potential risks which were then used to populate the risk register. The register was used to assign the raw risk rating, identify appropriate mitigation measures and assess the residual risk.

A total of 39 potential environmental risks were identified and assessed for the project. There were 34 medium or higher raw risks, with these being reduced to 10 Medium, 26 Low and three Negligible residual risks through the application of appropriate and effective mitigation measures. There were no residual high or extreme risks.

Key medium residual risks were associated with Biodiversity (9) and Social (1). These related to potential risks to public safety including from construction activities, bushfires and use of the trail, and to impacts to Leadbeater's Possum and Cool Temperate Rainforest.

The medium residual risks will be managed through world class design in accordance with the International Mountain Bicycling Association's *Guidelines for a Quality Trail Experience* (2017) and relevant management plans and environmental protocols to minimise risks to environmental matters from the project.

6 LIMITATIONS

This Report is provided by WSP Australia Pty Limited (WSP) for Yarra Ranges Shire Council (Client) in response to specific instructions from the Client and in accordance with WSP's proposal dated 4 July 2019 and agreement with the Client dated 10 July 2019 (Agreement).

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APPENDIX A


ENVIRONMENTAL RISK ASSESSMENT REGISTER




Project	Warburton Mountain Bike Destination	Lead	WSP	
Description	A proposed world class mountain biking destination centered around Warburton, It consists of approximately 110km of mountain bike trails providing both downhill and cross-country style trails and associated trail heads	Last Updated	12/12/2019	
Comments:				


			Raw Risk			Mitigation Measures / Design Response	Residual Risk		
Risk No.	Discipline	Environmental Risk	Consequence	Likelihood	Risk Rating		Consequence	Likelihood	Risk Rating
ACH1	Aboriginal Cultural Heritage	Impacts to known Aboriginal Heritage matters	Moderate	Unlikely	Medium	A Cultural Heritage Management Plan will be developed and implemented. A cultural heritage induction must be conducted with all site workers/contractors by representatives of the Wurundjeri (WLCCHCAC) immediately prior to the commencement of ground disturbance activities. A Heritage Advisor/archaeologist must also attend this training session. The induction must include: - a brief history of the Aboriginal occupation of the Activity Area and the broader region - a summary of the archaeological investigations conducted within the Activity Area - specific details of all Aboriginal Places and Heritage located during the CHMP assessment - a summary of the conditions and contingencies contained within the CHMP - the obligations of site workers/contractors and Sponsors under the Victorian Aboriginal Heritage Act 2006. Compliance inspections to be carried out by a Wurundjeri Representative Contingency plan within the CHMP must be followed in the event that unknown matters of Aboriginal Heritage are encountered during project activities.	Moderate	Rare	Low
ACH2	Aboriginal Cultural Heritage	Impacts to unidentified Aboriginal Heritage matters	Moderate	Possible	Medium	A Cultural Heritage Management Plan will be developed and implemented. A cultural heritage induction must be conducted with all site workers/contractors by representatives of the Wurundjeri (WLCCHCAC) immediately prior to the commencement of ground disturbance activities. A Heritage Advisor/archaeologist must also attend this training session. The induction must include: - a brief history of the Aboriginal occupation of the Activity Area and the broader region - a summary of the archaeological investigations conducted within the Activity Area - specific details of all Aboriginal Places and Heritage located during the CHMP assessment - a summary of the conditions and contingencies contained within the CHMP - the obligations of site workers/contractors and Sponsors under the Victorian Aboriginal Heritage Act 2006. Compliance inspections to be carried out by a Wurundjeri Representative Contingency plan within the CHMP must be followed in the event that unknown matters of Aboriginal Heritage are encountered during project activities.	Moderate	Rare	Low
AQ1	Air quality	Impacts to sensitive receptors during construction activities	Moderate	Possible	Medium	An Air Quality Management Plan should be prepared for the project as part of the overall Construction Environmental Management Plan. Best practice environmental management measures should be implemented to minimise particulate matter, odour and other air emissions at nearby sensitive receptor locations in accordance with relevant legislation and guidance. This may include activities such as water-spraying roads and areas of earthworks to limit particulate matter emissions.	Moderate	Rare	Low
AQ2	Air quality	Impacts to sensitive receptors during operation	Minor	Likely	Medium	Operational impacts can be reduced through the state and federal strategies including the adoption of more stringent fuel standards for vehicles, tighter exhaust emission standards, increased maintenance checks and emissions testing. Preparation of a Traffic Management Plan for special events will also be required to minimise excessive queueing, congestion and avoid accidents during peak visitor periods.	Minor	Unlikely	Low
BIO1	Biodiversity and Habitat	Impacts to the movement of LPB between canopy trees via bridging habitat provided by sub-canopy e.g. Silver Wattle, Blackwood, Pomaderris	Moderate	Likely	High	LBP P3 – Apply a 200m exclusion zone from the centre of all ANU monitoring plots. LBP M1 – No removal of dense stands of Callistemon or Tea Tree species within potential or suitable habitat for Leadbeaters possums. LBP M2 – Where removal of vegetation cannot be avoided, the alignment must utilise existing cleared areas. LBP M6 – The alignment of the trail cannot result in increased visibility to existing nest boxes or occupied tree hollows. Supervision and guidance by an ecologist within LBP habitats will be provided during the construction phase. Special Protection Zones (SPZs), including Leadbeater’s Possum (LBP) habitat should be avoided. Design treatments and a Construction Management Plan will manage vegetation removal and will include the establishment of no-go zones and flagging of the trail alignments to reduce risk of unauthorised clearing. Night use of the trails will be restricted in areas of LBP habitat Project will include environmental enhancement works such as species monitoring programs and installation of nesting boxes	Moderate	Rare	Low
BIO2	Biodiversity and Habitat	Impact to the MDB Wingless Stonefly	Major	Unlikely	Medium	SF M1 – Align trail as close as possible to the verge of Mt Donna Buang Road or use existing tracks SF M2 - Any work within the potential range of the species must minimise habitat disturbance and sedimentation by elevating the trail to cross waterways, bogs, damp areas or seasonal drainage lines within the mapped suitable habitat zone. SF M3 – Any elevated trail must be constructed to minimise ground disturbance and maintain natural light levels. SF P6 – Construction of the trail (near areas where MDB Wingless Stone Fly may occur) is to be undertaken between December and February. Design will avoid known locations of Wingless Stone Fly and minimise to the extent practicable, impacts to drainage lines, stream flow, bank integrity and erosion. Manage the construction process to avoid erosion and run-off into drainage lines.	Moderate	Rare	Low


Project			Warburton Mountain Bike Destination			Lead	WSP					
Description			A proposed world class mountain biking destination centered around Warburton, It consists of approximately 110km of mountain bike trails providing both downhill and cross-country style trails and associated trail heads			Last Updated	12/12/2019					
Comments:												
			Raw Risk							Residual Risk		
Risk No.	Discipline	Environmental Risk	Consequence	Likelihood	Risk Rating	Mitigation Measures / Design Response				Consequence	Likelihood	Risk Rating
BIO3	Biodiversity and Habitat	Impact to rainforest species and the potential spread of Myrtle Wilt	Moderate	Possible	Medium	CTR P1 – Prior to finalising the trail alignment, field surveys are required to identify the extent of Cool Temperate Mixed Forest within the area. CTR P3 - No rest stops or viewing areas are to be located within Cool Temperate Rainforest or Cool Temperate Mixed Forest. CTR M2 – Prior to finalising the trail alignment, undertake detailed mapping to clearly identify areas showing signs of Myrtle Wilt. CTR M3 - Where areas containing Myrtle Beech cannot be avoided, minimise disturbance within the drip line of all Myrtle Beech trees using a design/engineered solution. CTR M4 – In the event of any disturbance within the root zone or to any part of Myrtle Beech trees occurs, fungicide must be immediately applied to prevent the spread of Myrtle Wilt. CTR M5 –Trail construction is to be undertaken using hand tools only within Cool Temperate Rainforest and Cool Temperate Mixed Forest. CTR M6 – Where soils are damp and boggy, trail must be elevated using boardwalk or another appropriate engineered/design solution. Best practice Myrtle Wilt Control during construction and operation of the project (i.e. hygiene processes / wash down facilities). Design treatments and a Construction Management Plan will manage vegetation removal and will include the establishment of no-go zones and flagging of the trail alignments to reduce risk of unauthorised clearing. Comprehensive weed management program will be implemented following the trail construction, particularly in locations where high threat weeds were identified and mapped as a part of this project. Comprehensive pest animal program, particularly targeting Foxes and Deer will be implemented				Moderate	Rare	Low
BIO4	Biodiversity and Habitat	Impacts to Tree Protection Zones where excavation or compaction is required to form the trail. Potential disturbance to hollow dependent arboreal species	Moderate	Possible	Medium	NV M1 – The trail alignment is to be determined based on minimising the removal of vegetation, including mid-story and ground cover. NV M2 - Rest stops and viewing areas along the trail are to use existing cleared areas and breaks in vegetation to minimise vegetation removal. NV M3 - In State Forest where there is a stand of single age Eucalyptus sp (ie regrowth following bushfire), trees of up to 20 cm DBH may be removed. NV M3 – Where the structural root zones (defined by AS) of trees cannot be avoided, then a design solution will need to be implemented to reduce impact on tree root zones. NV M4 – Align the trail on the higher elevation side of large trees, especially on steeper side slopes as tree roots are likely to be closer to the surface on the lower side. NV M5 – Avoid removal of mid-storey vegetation within 10m of known or probable nesting sites of native fauna within National Park. NV M6 - Avoid removal of mid-storey vegetation within 10m of known nesting sites of listed (within VBA) fauna species within State Forest. NF M1 – Apply an appropriate buffer to identified nesting sites of significant native fauna identified in appendix 2, including applying a 5m buffer to rocky outcrops with cracks and crevices. NF M2 – Apply a 50m buffer to owl nesting sites. NF M3 – Apply an appropriate buffer/visual buffer to all tree hollows. In consultation with a Fauna and Tree specialist, define the exact alignment of the trail with the greatest setback distance possible from the trunks of significant trees. This includes avoiding the Structural Root Zone if excavation is greater than 600mm. No excavations deeper than 1m will occur within the Tree Protection Zone of large canopy trees. All trail alignments and all known site-specific environmental issues will be incorporated into the WorldTrail GIS platform which will be accessible by construction crew on site at all times Where tree roots are unavoidable, the trail will be constructed up and over tree roots though the use of boardwalks and elevated platforms. Design treatments and a Construction Management Plan will manage vegetation removal and will include the establishment of no-go zones and flagging of the trail alignments to reduce risk of unauthorised clearing. Project will include environmental enhancement works such as species monitoring programs and installation of nesting boxes				Minor	Possible	Low
BIO5	Biodiversity and Habitat	Disturbance to LBP nesting sites, Forest Owls and Bats	Moderate	Likely	High	LBP P3 – Apply a 200m exclusion zone from the centre of all ANU monitoring plots. LBP M1 – No removal of dense stands of Callistemon or Tea Tree species within potential or suitable habitat for Leadbeaters possums. LBP M2 – Where removal of vegetation cannot be avoided, the alignment must utilise existing cleared areas. LBP M6 – The alignment of the trail cannot result in increased visibility to existing nest boxes or occupied tree hollows. NF M2 – Apply a 50m buffer to owl nesting sites. NF M3 – Apply an appropriate buffer/visual buffer to all tree hollows. All trail alignments and all known site-specific environmental issues will be incorporated into the WorldTrail GIS platform which will be accessible by construction crew on site at all times Project will include environmental enhancement works such as species monitoring programs and installation of nesting boxes				Moderate	Unlikely	Medium

Project	Warburton Mountain Bike Destination	Lead	WSP	
Description	A proposed world class mountain biking destination centered around Warburton, It consists of approximately 110km of mountain bike trails providing both downhill and cross-country style trails and associated trail heads	Last Updated	12/12/2019	
Comments:				


			Raw Risk				Residual Risk		
Risk No.	Discipline	Environmental Risk	Consequence	Likelihood	Risk Rating	Mitigation Measures / Design Response	Consequence	Likelihood	Risk Rating
BIO6	Biodiversity and Habitat	Impact to local populations of rare or threatened flora	Moderate	Likely	High	NV M9 – Apply an appropriate buffer to significant native flora species and communities identified in appendix 1, in consultation with the relevant public land manager. Design will avoid direct loss through conscientious siting of the final trail in consultation with a flora specialist onsite during a seasonally appropriate period. Threatened flora populations are sparse and can largely be avoided, however given the dense groundcover presents and seasonally inconspicuous nature of some species, complete avoidance cannot be guaranteed Design treatments and a Construction Management Plan will manage vegetation removal and will include the establishment of no-go zones and flagging of the trail alignments to reduce risk of unauthorised clearing. All trail alignments and all known site-specific environmental issues will be incorporated into the WorldTrail GIS platform which will be accessible by construction crew on site at all times. Comprehensive weed management program will be implemented following the trail construction, particularly in locations where high threat weeds were identified and mapped as a part of this project. Comprehensive pest animal program, particularly targeting Foxes and Deer will be implemented	Moderate	Unlikely	Medium
BIO7	Biodiversity and Habitat	Impact to some habitat (mostly invertebrates)	Moderate	Likely	High	NV M10 – Any removal of fallen timber must be to the minimum extent necessary and any material removed must be retained on site. Any small dead trees <less than 200mm diameter within 2 metres of the trail may require removal if significant defects are identified. Fell unstable trees and keep them as habitat logs within the nearby forested areas. All trail alignments and all known site-specific environmental issues will be incorporated into the WorldTrail GIS platform which will be accessible by construction crew on site at all times Comprehensive weed management program will be implemented following the trail construction, particularly in locations where high threat weeds were identified and mapped as a part of this project. Comprehensive pest animal program, particularly targeting Foxes and Deer will be implemented.	Moderate	Rare	Low
BIO8	Biodiversity and Habitat	Impact to high quality vegetation beyond the trail width	Major	Likely	High	Design has aimed, to the greatest extent possible, to avoid high quality and protected vegetation Removal of vegetation will be to the minimum extent required, usually approximately 1.2m width, and will not exceed 2.0m width. Design treatments and a Construction Management Plan will manage vegetation removal and will include the establishment of no-go zones and flagging of the trail alignments to reduce risk of unauthorised clearing. All trail alignments and all known site-specific environmental issues will be incorporated into the WorldTrail GIS platform which will be accessible by construction crew on site at all times Comprehensive weed management program will be implemented following the trail construction, particularly in locations where high threat weeds were identified and mapped as a part of this project. Comprehensive pest animal program, particularly targeting Foxes and Deer will be implemented	Moderate	Unlikely	Medium
BIO9	Biodiversity and Habitat	Construction activities cause bushfire	Major	Possible	High	CEMP will include requirements for fire risk management including but not limited to: - Observation of all requirements under legislation including fire bans and or any direction from YRSC, Parks Victoria's or DELWP. - No smoking or fires on the work site - Spark arrestors to be fitted to all excavators/machinery - Provision and maintenance of fire suppression equipment - Communication in case of an emergency - Fuel storage and Re-fuelling of equipment and machinery - Machinery (chainsaws, brushcutters etc.) storage when not in use A Bushfire Management Plan will be implemented	Major	Rare	Medium
BIO10	Biodiversity and Habitat	Users go off-trail and cause impacts to vegetation	Moderate	Possible	Medium	Full time maintenance workers will maintain the trails to ensure they remain in good condition Operations Management Plan will include monitoring for any off-trail tracks and process for closing unauthorised trails and rehabilitation where appropriate. Design will discourage use by constructing a world class trail that meets the needs and desires of its users minimising the desire to go off-trail	Moderate	Rare	Low


Project			Warburton Mountain Bike Destination			Lead	WSP				
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Comments:											
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Risk No.	Discipline	Environmental Risk	Consequence	Likelihood	Risk Rating	Mitigation Measures / Design Response			Consequence	Likelihood	Risk Rating
BIO11	Biodiversity and Habitat	A break in the canopy will increase light to the forest floor which will create changes in microclimate and have a negative impact on the ecological system.	Moderate	Likely	High	NV M1 – The trail alignment is to be determined based on minimising the removal of vegetation, including mid-story and ground cover. NV M2 - Rest stops and viewing areas along the trail are to use existing cleared areas and breaks in vegetation to minimise vegetation removal. NV M3 - In State Forest where there is a stand of single age Eucalyptus sp (ie regrowth following bushfire), trees of up to 20 cm DBH may be removed. NV M5 – Avoid removal of mid-storey vegetation within 10m of known or probable nesting sites of native fauna within National Park. NV M6 - Avoid removal of mid-storey vegetation within 10m of known nesting sites of listed (within VBA) fauna species within State Forest. Design has aimed, to the greatest extent possible, to avoid high quality and protected vegetation. Removal of vegetation will be to the minimum extent required, usually approximately 1.2m width, and will not exceed 2.0m width. Design treatments and a Construction Management Plan will manage vegetation removal and will include the establishment of no-go zones and flagging of the trail alignments to reduce risk of unauthorised clearing.			Minor	Possible	Low
BIO12	Biodiversity and Habitat	A break in vegetation connectivity at any strata layer will negatively impact movement corridors of native fauna that rely on heavy vegetation cover to move through the landscape protected from predators.	Moderate	Likely	High	NV M1 – The trail alignment is to be determined based on minimising the removal of vegetation, including mid-story and ground cover. NV M2 - Rest stops and viewing areas along the trail are to use existing cleared areas and breaks in vegetation to minimise vegetation removal. NV M3 - In State Forest where there is a stand of single age Eucalyptus sp (ie regrowth following bushfire), trees of up to 20 cm DBH may be removed. NV M5 – Avoid removal of mid-storey vegetation within 10m of known or probable nesting sites of native fauna within National Park. NV M6 - Avoid removal of mid-storey vegetation within 10m of known nesting sites of listed (within VBA) fauna species within State Forest. Design has aimed, to the greatest extent possible, to avoid high quality and protected vegetation. Removal of vegetation will be to the minimum extent required, usually approximately 1.2m width, and will not exceed 2.0m width. Design treatments and a Construction Management Plan will manage vegetation removal and will include the establishment of no-go zones and flagging of the trail alignments to reduce risk of unauthorised clearing. Comprehensive pest animal program, particularly targeting Foxes and Deer will be implemented.			Minor	Possible	Low
BIO13	Biodiversity and Habitat	Disturbance to the ground cover and removal of vegetation will allow introduction and spread of weed species and pathogens. This includes the spread of Myrtle Wilt and Phytophthora.	Major	Likely	High	CTR M2 – Prior to finalising the trail alignment, undertake detailed mapping to clearly identify areas showing signs of Myrtle Wilt. CTR M3 - Where areas containing Myrtle Beech cannot be avoided, minimise disturbance within the drip line of all Myrtle Beech trees using a design/engineered solution. CTR M4 – In the event of any disturbance within the root zone or to any part of Myrtle Beech trees occurs, fungicide must be immediately applied to prevent the spread of Myrtle Wilt. CTR M5 –Trail construction is to be undertaken using hand tools only within Cool Temperate Rainforest and Cool Temperate Mixed Forest. CTR M6 – Where soils are damp and boggy, trail must be elevated using boardwalk or another appropriate engineered/design solution. NV M7 – Undertake weed and pathogen control along the trail corridor during construction in accordance with an approved CEMP. Design has aimed, to the greatest extent possible, to avoid high quality and protected vegetation. Removal of vegetation will be to the minimum extent required, usually approximately 1.2m width, and will not exceed 2.0m width. Comprehensive weed management program will be implemented following the trail construction, particularly in locations where high threat weeds were identified and mapped as a part of this project.			Major	Unlikely	Medium
BIO14	Biodiversity and Habitat	The introduction of fill material may introduce weeds and pathogens and potential alter Ph levels of the soil which will have a negative impact on the health of the system.	Major	Possible	High	NV P10 – Minimise the introduction of fill material for the construction and ongoing management of the trail. NV P11 – Any fill material introduced to the site must be certified clean and be weed and pathogen free and be of a similar pH to natural soils. CTR M6 – Where soils are damp and boggy, trail must be elevated using boardwalk or another appropriate engineered/design solution. NV M7 – Undertake weed and pathogen control along the trail corridor during construction in accordance with an approved CEMP. Comprehensive weed management program will be implemented following the trail construction, particularly in locations where high threat weeds were identified and mapped as a part of this project.			Major	Unlikely	Medium

Project			Warburton Mountain Bike Destination			Lead	WSP				
Description			A proposed world class mountain biking destination centered around Warburton, It consists of approximately 110km of mountain bike trails providing both downhill and cross-country style trails and associated trail heads			Last Updated	12/12/2019				
Comments:											
			Raw Risk						Residual Risk		
Risk No.	Discipline	Environmental Risk	Consequence	Likelihood	Risk Rating	Mitigation Measures / Design Response			Consequence	Likelihood	Risk Rating
BIO15	Biodiversity and Habitat	The reduction in overall area of Cool Temperate Rainforest and Cool Temperate Mixed Forest given their current limited distribution.	Catastrophic	Likely	Extreme	NV M1 – The trail alignment is to be determined based on minimising the removal of vegetation, including mid-story and ground cover. NV M2 - Rest stops and viewing areas along the trail are to use existing cleared areas and breaks in vegetation to minimise vegetation removal. CTR P1 – Prior to finalising the trail alignment, field surveys are required to identify the extent of Cool Temperate Mixed Forest within the area. CTR P3 - No rest stops or viewing areas are to be located within Cool Temperate Rainforest or Cool Temperate Mixed Forest. CTR M1 – Minimise the length of the alignment through Cool Temperate Rainforest and Cool Temperate Mixed Forest. CTR M5 –Trail construction is to be undertaken using hand tools only within Cool Temperate Rainforest and Cool Temperate Mixed Forest CTR M7 – A trail design approved by a suitably qualified professional should be used to reduce the potential for soil compaction and other impacts to surface hydrology over time. Design has aimed, to the greatest extent possible, to avoid high quality and protected vegetation. Removal of vegetation will be to the minimum extent required, usually approximately 1.2m width, and will not exceed 2.0m width. Design treatments and a Construction Management Plan will manage vegetation removal and will include the establishment of no-go zones and flagging of the trail alignments to reduce risk of unauthorised clearing. All trail alignments and all known site-specific environmental issues will be incorporated into the WorldTrail GIS platform which will be accessible by construction crew on site at all times Rest stops and viewing areas along the trail are to use existing cleared areas and breaks in vegetation to minimise vegetation removal.			Moderate	Possible	Medium
BIO16	Biodiversity and Habitat	Construction and use of the trail will interfere with the existing movement corridors of significant native fauna which may cause displacement of some species, impact available food sources and segregate habitat areas.	Moderate	Likely	High	LBP P3 – Apply a 200m exclusion zone from the centre of all ANU monitoring plots. LBP M1 – No removal of dense stands of Callistemon or Tea Tree species within potential or suitable habitat for Leadbeaters possums. LBP M2 – Where removal of vegetation cannot be avoided, the alignment must utilise existing cleared areas. LBP M6 – The alignment of the trail cannot result in increased visibility to existing nest boxes or occupied tree hollows. NF M2 – Apply a 50m buffer to owl nesting sites. NF M3 – Apply an appropriate buffer/visual buffer to all tree hollows. NV M1 – The trail alignment is to be determined based on minimising the removal of vegetation, including mid-story and ground cover. NV M2 - Rest stops and viewing areas along the trail are to use existing cleared areas and breaks in vegetation to minimise vegetation removal. NV M3 - In State Forest where there is a stand of single age Eucalyptus sp (ie regrowth following bushfire), trees of up to 20 cm DBH may be removed. NV M3 – Where the structural root zones (defined by AS) of trees cannot be avoided, then a design solution will need to be implemented to reduce impact on tree root zones. NV M4 – Align the trail on the higher elevation side of large trees, especially on steeper side slopes as tree roots are likely to be closer to the surface on the lower side. NV M5 – Avoid removal of mid-storey vegetation within 10m of known or probable nesting sites of native fauna within National Park. NV M6 - Avoid removal of mid-storey vegetation within 10m of known nesting sites of listed (within VBA) fauna species within State Forest. NF M1 – Apply an appropriate buffer to identified nesting sites of significant native fauna identified in appendix 2, including applying a 5m buffer to rocky outcrops with cracks and crevices. NF M2 – Apply a 50m buffer to owl nesting sites. NF M3 – Apply an appropriate buffer/visual buffer to all tree hollows. NF M4 – Apply a 20m buffer to lyrebird display mounds. Design has aimed, to the greatest extent possible, to avoid high quality and protected vegetation. Removal of vegetation will be to the minimum extent required, usually approximately 1.2m width, and will not exceed 2.0m width. Project will include environmental enhancement works such as species monitoring programs and installation of nesting boxes Design treatments and a Construction Management Plan will manage vegetation removal and will include the establishment of no-go zones and flagging of the trail alignments to reduce risk of unauthorised clearing.			Moderate	Unlikely	Medium
BIO17	Biodiversity and Habitat	A break in vegetation connectivity will create movement corridors for predatory and pest animals.	Moderate	Likely	High	NV M1 – The trail alignment is to be determined based on minimising the removal of vegetation, including mid-story and ground cover. NV M2 - Rest stops and viewing areas along the trail are to use existing cleared areas and breaks in vegetation to minimise vegetation removal. NV M3 - In State Forest where there is a stand of single age Eucalyptus sp (ie regrowth following bushfire), trees of up to 20 cm DBH may be removed. NV M5 – Avoid removal of mid-storey vegetation within 10m of known or probable nesting sites of native fauna within National Park. NV M6 - Avoid removal of mid-storey vegetation within 10m of known nesting sites of listed (within VBA) fauna species within State Forest. Design has aimed, to the greatest extent possible, to avoid high quality and protected vegetation. Removal of vegetation will be to the minimum extent required, usually approximately 1.2m width, and will not exceed 2.0m width. Project will include environmental enhancement works such as species monitoring programs and installation of nesting boxes Avoid removal of mid-storey vegetation within 10m of known nesting sites of protected/listed fauna species. Comprehensive pest animal program, particularly targeting Foxes and Deer will be implemented.			Moderate	Possible	Medium
E1	Economic	Negative impact on economy of the town of Warburton	Insignifcant	Rare	Negligible	Analysis provided strong evidence, based on achievable and relatively conservative estimates, that the proposed Warburton Mountain Bike Destination has a strong net economic benefit to the region.			Insignificant	Rare	Negligible

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Comments:				

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Risk No.	Discipline	Environmental Risk	Consequence	Likelihood	Risk Rating	Mitigation Measures / Design Response	Consequence	Likelihood	Risk Rating
GW1	Groundwater	Groundwater contamination from construction activities	Moderate	Unlikely	Medium	Project is not likely to encounter or impact groundwater Standard CEMP controls for spill containment and clean-up including; - Ensure all machinery maintained and serviced. - Inspect all machinery before operation for fuel, oil or hydraulic fluid leaks. - Re-fuelling only as per project management controls - Spill kits to be maintained on site at all times - All staff to be trained in the use of spill kits - All spills to be immediately reported to the principal	Moderate	Rare	Low
HH1	Historic Heritage	Impacts to identified historic archaeological and heritage places, and areas of historical and archaeological sensitivity	Moderate	Unlikely	Medium	Construction works will be designed to minimise impacts and assist in managing the place including avoiding cutting across tramway formations, water races and sluice banks. During construction, a program of inspection and archaeological monitoring should be carried out in areas of historical and archaeological sensitivity by a suitably qualified Historical archaeologist Permits to be obtained from Heritage Victoria and YRSC where required A protocol should be developed and implemented in the event unidentified heritage materials are encountered during construction An induction should be presented by a suitably qualified heritage professional on site, which covers need to avoid historical and archaeological features, how to recognise them, and who to contact should unexpected historical and archaeological features or objects should be discovered during works. Excavation will be completed by hand where possible for surface shaping, drainage/low area shaping, surface raking, shaping of dirt trail features, edge battering, rock work, vegetation pruning and naturalisation. Small rubber tracked mini excavators will be used, where required, particularly for battering works.	Moderate	Rare	Low
HH2	Historic Heritage	Impacts to unidentified historic archaeological and heritage places	Moderate	Possible	Medium	Construction works will be designed to minimise impacts and assist in managing the place including avoiding cutting across tramway formations, water races and sluice banks. During construction, a program of inspection and archaeological monitoring should be carried out in areas of historical and archaeological sensitivity by a suitably qualified Historical archaeologist Permits to be obtained from Heritage Victoria and YRSC where required A protocol should be developed and implemented in the event unidentified heritage materials are encountered during construction An induction should be presented by a suitably qualified heritage professional on site, which covers need to avoid historical and archaeological features, how to recognise them, and who to contact should unexpected historical and archaeological features or objects should be discovered during works. Excavation will be completed by hand where possible for surface shaping, drainage/low area shaping, surface raking, shaping of dirt trail features, edge battering, rock work, vegetation pruning and naturalisation. Small rubber tracked mini excavators will be used, where required, particularly for battering works.	Moderate	Rare	Low
NV1	Noise and vibration	Impacts to sensitive receptors from ground vibration and airborne noise from increased traffic	Minor	Possible	Low	Traffic volumes are predicted to result in a maximum increase in noise level of 3 dBA. This level of increase is generally regarded as a moderate change and may be noticeable to local residents.	Minor	Possible	Low
NV2	Noise and vibration	Impacts to sensitive receptors from ground vibration and airborne noise during construction of trails	Minor	Rare	Negligible	Low noise emission construction methods and limited sensitive receptors near majority of the length of the trails. Trail construction will be undertaken predominantly using hand tools and small excavators where required. Comply with Warburton Mountain Bike Destination: Environmental Protocols	Minor	Rare	Negligible
NV3	Noise and vibration	Impacts to sensitive receptors from ground vibration and airborne noise during construction Main trail head	Moderate	Possible	Medium	Construction will be undertaken in accordance with relevant building codes and council requirements. CEMP will include measures to minimise vibration and noise impacts during construction including, but not limited to; - restricting work hours in accordance with council regulations - machinery to be turned off when not in use - excavation restricted to minimum required by the project	Moderate	Rare	Low
S1	Social	Impacts to land access	Minor	Unlikely	Low	All existing access to private property will be maintained during both construction and operation Where possible maintain a buffer from private properties. Ideally, no dwellings should be within eyesight of the trail, with a buffer of vegetation between the dwelling and the trail.	Minor	Rare	Negligible
S2	Social	Impacts to valued community assets/space	Minor	Possible	Low	Short term impacts to current use of trails during construction. Warburton Place Plan is being developed that will identify specific infrastructure improvements in the town.	Minor	Unlikely	Low

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S3	Social	Increased risk to public safety	Catastrophic	Possible	High	CEMP will include provisions to project public from construction activities including, but not limited to; - Restricting access to construction areas, - Traffic Management The project seeks to make existing illegal and unsafe tracks safer by legitimising some of these tracks and constructing these to international standards while closing the more dangerous tracks. Emergency management plans will be in place for operation of the facility including bushfire management plan which will include procedures for closure of the facility during high bushfire risk periods and evacuation of the facility. Where possible maintain a buffer from private properties. Ideally, no dwellings should be within eyesight of the trail, with a buffer of vegetation between the dwelling and the trail.				Major	Rare	Medium
SG1	Soils and Geology	Soil erosion	Major	Likely	High	HV M1 – Minimise alignment through steep slopes to reduce the amount of excavation in National Park. Trail will be design to International Mountain Bicycling Association Standards 2017 Control and redirect water runoff from the trails to prevent it from flowing onto the slope uncontrolled. Construct armouring where a shallow failure has been observed. Sediment run-off during construction will be minimised by immediate compaction using excavator and hand, following trail construction. No trail section longer than 50m will be left uncompacted. Sediment run-off post construction will be minimised by the rolling contour style of trail with grade reversals every <10m, ensuring no concentrated/high velocity water flows across the trail tread. Steeply sloping sites were avoided in the selection of trail alignment. Silt fencing to be installed at the low side of each creek/wet crossing Design considered specifications for top side batters, rock armouring, silt fencing, wet weather, soil stockpiles Erosion and sediment control measures will remain in place until rehabilitation works are completed, and trail surface is firm, compacted and stable. Drainage and sediment controls will follow: "Managing Urban Stormwater: Soils and Construction" (4th Edition on Landcom, 2004) The trail will be rested for as long as possible before allowing riders to use it to allow the trail tread to settle and harden before being subjected to use.				Minor	Possible	Low
SG2	Soils and Geology	Slope instability and geotechnical hazards, such as landslides	Major	Likely	High	HV M1 – Minimise alignment through steep slopes to reduce the amount of excavation in National Park. Trail will be design to International Mountain Bicycling Association Standards 2017 Control and redirect water runoff from the trails to prevent it from flowing onto the slope uncontrolled. Construct armouring where a shallow failure has been observed. Avoid constuction during winter and following heavy rainfall. Implement a trail construction and management plan and report any observed failure along the trail slopes for further assessment (both during and post construction). The following are recommended to minimise rock fall hazards: – Manage surface drainage (as above). – Remove any loose or disturbed boulders in trail earthworks. – Report any rock fall incidents to a geotechnical engineer for further assessment. – Prior to finalising each trail ensure potential rock fall risks are removed from the trail.				Moderate	Rare	Low

Project		Warburton Mountain Bike Destination	Lead	WSP								
Description		A proposed world class mountain biking destination centered around Warburton, It consists of approximately 110km of mountain bike trails providing both downhill and cross-country style trails and associated trail heads	Last Updated	12/12/2019								
Comments:												
			Raw Risk						Residual Risk			
Risk No.	Discipline	Environmental Risk	Consequence	Likelihood	Risk Rating	Mitigation Measures / Design Response	Consequence	Likelihood	Risk Rating			
SW1	Surface Water	Impact to water quality in drainage and waterways	Major	Possible	High	WQ P1 - Apply Water Act definition to determine presence and extent of waterways – i.e. natural channel where water regularly flows whether or not the flow is continuous or lake, lagoon, swamp or marsh. (Vegetation class can be a good indicator of presence and extent of water on site and thus WQ P3 – Apply a 20m streamside buffer to minor waterways (<60ha catchment). WQ P4 – Apply a 30m streamside buffer for larger waterways (>60ha catchment) WQ P5 – No trails within Coranderrk Creek water supply drinking catchment. WQ P6 - Implement Melbourne Water requirements for works on waterways and crossings. WQ P7 – No ford crossings through waterway flow paths. WQ M1 – Span bridges are to be used in preference to culverts wherever practical. WQ M2 - Where waterway crossing is required, identify the narrowest practicable location. WQ M3 - All waterway crossings are to be elevated (no rock armouring, no wheels crossing through the flow path). Follow the below Guidelines. - Environmental Guidelines for Major Construction Sites (EPA Publication 480); - Construction Techniques for Sediment Pollution Control (EPA Publication 275); - Constructing waterway crossings: A guide on building road (Bridge/Culvert) crossings across Melbourne Water’s waterways and drains; - Hydrogeological Assessment (Groundwater Quality) Guidelines (EPA Publication 668); - Groundwater Sampling Guidelines (EPA Publication 669). - Construction Techniques for Sediment Pollution Control (EPA Victoria, 1991) - The International Erosion Control Associations’ (IECA) Best Practice Erosion and Sediment Control Manual 2008 Trail will be design to International Mountain Bicycling Association Standards 2017 Meet SEPP (Waters) water quality objectives in tributaries that will be crossed by the trail network. Sediment run-off during construction will be minimised by immediate compaction using excavator and hand, following trail construction. Avoid constuction during winter and following heavy rainfall. No trail section longer than 50m will be left uncompacted. Sediment run-off post construction will be minimised by the rolling contour style of trail with grade reversals every <10m, ensuring no concentrated/high velocity water flows across the trail tread. Silt fencing to be installed at the low side of each creek/wet crossing Design considered specifications for top side batters, rock armouring, silt fencing, wet weather and soil stockpiles Erosion and sediment control measures will remain in place until rehabilitation works are completed, and trail surface is firm, compacted and stable. Drainage and sediment controls will follow: "Managing Urban Stormwater: Soils and Construction" (4th Edition on Landcom, 2004) Fuels will be stored in a secure bund away from waterways Runoff from the wash down of equipment will be contained away from waterways and removed from site. Any stream crossings will need to be strictly designed with rock armouring on intermittent trails or small bridges on raised pedestals either side of the stream. Refer to design treatments outlined in section 4.4 Trail Construction Plan (Cox Architecture). Manage the construction process to avoid erosion and run-off into drainage lines and apply design treatments and construction principles outlined in the Trail Construction Plan (Cox Architecture)	Minor	Possible	Low			
SW2	Surface Water	Impacts to water flows	Moderate	Possible	Medium	WQ P1 - Apply Water Act definition to determine presence and extent of waterways – i.e. natural channel where water regularly flows whether or not the flow is continuous or lake, lagoon, swamp or marsh. (Vegetation class can be a good indicator of presence and extent of water on site and thus WQ P3 – Apply a 20m streamside buffer to minor waterways (<60ha catchment). WQ P4 – Apply a 30m streamside buffer for larger waterways (>60ha catchment) WQ P5 – No trails within Coranderrk Creek water supply drinking catchment. WQ P6 - Implement Melbourne Water requirements for works on waterways and crossings. WQ P7 – No ford crossings through waterway flow paths. WQ M1 – Span bridges are to be used in preference to culverts wherever practical. WQ M2 - Where waterway crossing is required, identify the narrowest practicable location. WQ M3 - All waterway crossings are to be elevated (no rock armouring, no wheels crossing through the flow path). Follow the below Guidelines. - Environmental Guidelines for Major Construction Sites (EPA Publication 480); - Construction Techniques for Sediment Pollution Control (EPA Publication 275); - Constructing waterway crossings: A guide on building road (Bridge/Culvert) crossings across Melbourne Water’s waterways and drains; - Hydrogeological Assessment (Groundwater Quality) Guidelines (EPA Publication 668); - Groundwater Sampling Guidelines (EPA Publication 669). - Construction Techniques for Sediment Pollution Control (EPA Victoria, 1991) - The International Erosion Control Associations’ (IECA) Best Practice Erosion and Sediment Control Manual 2008 Trail will be design to International Mountain Bicycling Association Standards 2017 Meet SEPP (Waters) water quality objectives in tributaries that will be crossed by the trail network. Ensure that all new crossings must allow for unrestricted passage for aquatic fauna. The creek crossing will comply with the Works on Waterways permit. Other Controls will include - Design avoids creek crossings located near project sensitive “no go zones”. - Use of rolling contour trail design and avoidance of flat areas or fall line. - All creek crossings will be fitted with rock armouring, including armouring to entry and exit points beyond the wet area - Grade reversals/drainage measures to be installed at the entry and exit to each creek crossing to limit water flow onto and into the water course - Silt fencing to be installed at the low side of each creek/wet crossing - Vegetation on and any organic matter is not to be placed in any waterway, low area or area where water flow volumes are likely - A buffer strip of vegetation will be retained near water courses	Minor	Possible	Low			

Project			Warburton Mountain Bike Destination			Lead	WSP				
Description			A proposed world class mountain biking destination centered around Warburton, It consists of approximately 110km of mountain bike trails providing both downhill and cross-country style trails and associated trail heads			Last Updated	12/12/2019				
Comments:											
			Raw Risk						Residual Risk		
Risk No.	Discipline	Environmental Risk	Consequence	Likelihood	Risk Rating	Mitigation Measures / Design Response			Consequence	Likelihood	Risk Rating
TT1	Transport	Impacts to public transport routes	Moderate	Unlikely	Medium	Design will ensure existing bus routes and bus stops are not impacted by the project			Moderate	Rare	Low
TT2	Transport	Impact to Cyclist and pedestrian facilities	Minor	Likely	Medium	Appropriate pedestrian pathways and connections shall be provided to facilitate safe pedestrian access between the car park, golf course, trail head buildings and mini-bus area Provision of safe pedestrian/cyclist crossing points to allow for access to the Main trail head from the town of Warburton Speed control devices can also be considered to further improve cyclist safety e.g. speed humps or one-lane slow points with bicycle cut-throughs.			Minor	Possible	Low
TT3	Transport	Increase in traffic causing congestion and parking shortages	Major	Possible	High	The trails have been designed to be a "ride in, ride out" experience from the main trail head in Warburton. The design is aimed at reducing private car shuttling and avoiding traffic/parking congestion in the Mt Tugwell area. Preventable measures being considered include, but are not limited to: - Limiting road side access to the trail network - Having a designated shuttle drop off point that only licensed, commercial shuttle operators have access to - Limiting access to shuttle roads Additional parking spaces will be provided to accommodate forecast parking demand during normal operation Vehicle access shall be provided via two locations to Dammans Road The existing golf course crossover shall be upgraded and widened to more comfortably accommodate simultaneous two-way traffic flow A separate shuttle bus parking area shall be provided to minimise conflict between shuttle bus operations and general traffic			Minor	Possible	Low
LV1	Visual and Landscape	Impacts on visual and landscape amenity	Moderate	Possible	Medium	Sensitive design principles will be employed during detailed design to minimise impacts to visual and landscape amenity. Potential mitigation measures may include; - adopting alternative designs to blend into the landscape - remedial measures such as colour and textural treatment of structural features; - compensatory measures such as landscape design to compensate for unavoidable negative impacts and to attempt to generate long-term positive impacts - design and infrastructure positioning will consider the landscape character of the area including requirements under any relevant planning overlays - avoid removal of vegetation to the extent possible - alignment should be sited in accordance with the natural landform to avoid earthworks. - materiality selection (e.g. rocks and timber) for proposed trails should respond to the local environment and be locally sourced where possible - permanent lighting will be in accordance with AS 4282-1997. Control of obtrusive effects of outdoor lighting to avoid light spill into adjacent residential properties and the Yarra River corridor. - retain and enhance visual screening, such as buffer planting, of existing and proposed car parking area when viewed from Dammans Road			Minor	Possible	Low

APPENDIX B

ENVIRONMENTAL PROTOCOLS



Warburton Mountain Bike Destination: Environmental Protocols

December 2019

The Warburton Mountain Bike Destination: Environmental Protocols (the Protocols) outline the environmental standards to be met in the alignment of trails.

The protocols are intended to guide the design of alignments that result in minimal environmental disturbance and ensuring that any disturbance to environmental values can be appropriately mitigated where they cannot be avoided. These protocols relate to the alignment of the trail, but include some measures relating to the construction and operation of the trail where there is a reasonable expectation that these will impact the alignment itself. It is acknowledged that further work will be undertaken to develop a Construction Environmental Management Plan and an Operations Management Plan to provide further guidance on these factors.

These protocols were developed in conjunction with species experts for Cool Temperate Rainforest, Leadbeater's Possum and Mt Donna Buang Wingless Stonefly and are the combined work of the following organisations:

- Yarra Ranges Council
- Department of Environment, Land, Water and Planning (DELWP)
- Parks Victoria
- Practical Ecology
- World Trail

The following standards and mitigation measures are based on information about the natural values that is currently known, and it is acknowledged that due to the remoteness and lack of disturbance in some of these areas, further ecological assessments, including field surveys at seasonally appropriate times of year will be required. The results of these surveys may require amendments to this document and further approval by the relevant land manager.

The protocols have been divided to provide clarity and to better define the risk to each value. However, there are sections within the landscape where these values overlap and the protocols for each individual value will need to be applied in these instances. For example, on the summit of Mount Donna Buang, there are known occurrences of Cool Temperate Rainforest, Cool Temperate Mixed Forest, Leadbeater's Possum, Mount Donna Buang Wingless Stonefly and native vegetation.

Application of the protocols:

These protocols are divided into ecological values that are present in the landscape and attempts to summarise the potential risk to these values resulting from the construction and operation of the trail. The column labelled 'Protocol' sets out the standard that should be met to completely avoid the risk to the value. However, it is acknowledged that not all standards will be realistic throughout the landscape and mitigation measures have been developed to minimise the impact to the values in these cases. There are some standards where no mitigation measures have been described and in these cases, the risk to the value is considered so high, that the protocol must be implemented.

In cases where neither the standard, nor the mitigation measure is considered possible to implement, then direct negotiations with the land managers will be required to develop an appropriate response. This may include meetings on site and consultation with values experts. Any negotiations for works that are inconsistent with these protocols must be agreed in writing by the relevant public land manager and/or Melbourne Water.

Ecological value	Risk to value	Protocol	Mitigation measures
Native Vegetation (NV)	A break in the canopy will increase light to the forest floor which will create changes in microclimate and have a negative impact on the ecological system.	NV P1 - Any native vegetation removal requires avoidance, minimisation and offsetting in accordance with the 'Guidelines for The Removal, Destruction or Lopping of Native Vegetation (DELWP 2017)'	NV M1 – The trail alignment is to be determined based on minimising the removal of vegetation, including mid-story and ground cover.
		NV P2 – No vegetation is to be removed to accommodate rest stops or viewing areas in National Park.	NV M2 - Rest stops and viewing areas along the trail are to use existing cleared areas and breaks in vegetation to minimise vegetation removal.
		NV P3 - No trees, including mid-storey trees of more than 10cm DBH are to be removed.	NV M3 - In State Forest where there is a stand of single age Eucalyptus sp (i.e. regrowth following bushfire), trees of up to 20 cm DBH may be removed.
	Damage to tree roots during construction and use of the trail will negatively impact the long-term health of tree species.	NV P4 – Avoid aligning the trail within the structural root zones of all trees.	NV M4 – Where the structural root zones (defined by AS) of trees cannot be avoided, then a design solution will need to be implemented to reduce impact on tree root zones.

Ecological value	Risk to value	Protocol	Mitigation measures
			NV M5 – Align the trail on the higher elevation side of large trees, especially on steeper side slopes as tree roots are likely to be closer to the surface on the lower side.
	A break in vegetation connectivity at any strata layer will negatively impact movement corridors of native fauna that rely on heavy vegetation cover to move through the landscape protected from predators.	NV P5 – Avoid existing stands of dense vegetation, particularly mid-storey vegetation between 1-5m in height.	NV M6 – Avoid removal of mid-storey vegetation within 10m of known or probable nesting sites of native fauna within National Park. NV M7 – Avoid removal of mid-storey vegetation within 10m of known nesting sites of listed (within VBA) fauna species within State Forest.
	A break in vegetation connectivity will create movement corridors for predatory and pest animals.		
	Disturbance to the ground cover and removal of vegetation will allow introduction and spread of weed species and pathogens. This includes the spread of Myrtle Wilt and Phytophthora.	NV P6 – Avoid disturbance to the ground surface in areas known to contain invasive weeds and pathogens including Myrtle Wilt and Phytophthora.	NV M8 – Undertake weed and pathogen control along the trail corridor during construction in accordance with an approved CEMP.
	The introduction of fill material may introduce weeds and pathogens and potentially alter pH levels of the soil which will have a negative impact on the health of	NV P7 – Minimise the introduction of fill material for the construction and ongoing management of the trail.	NV M9 – Any fill material introduced to the site must be certified clean and be weed and pathogen free and be of a similar pH to natural soils.

Ecological value	Risk to value	Protocol	Mitigation measures
	the system.		
	The construction and use of the trail may have negative impacts on significant native flora, including listed species.	NV P8 – Prior to the trail alignment being finalised, detailed field surveys are required to identify the likely presence of significant species or communities identified in appendix 1.	
		NV P9 – Avoid areas known or are likely to contain significant species or communities, as identified in appendix 1, including species listed under FFG and EPBC and advisory listed.	NV M10 – Apply an appropriate buffer to significant native flora species and communities identified in appendix 1, in consultation with the relevant public land manager.
	Large fallen debris (>30cm DBH) is part of the natural cycle of the area and provides important habitat for local fauna and assists in soil stabilisation.	NV P10 – Avoid any removal or disturbance to large fallen timber.	NV M11 – Any removal of fallen timber must be to the minimum extent necessary and any material removed must be retained on site.
Cool Temperate Rainforest (EVC 31) & Cool Temperate Mixed Forest (EVC145) (CTR)	The reduction in overall area of Cool Temperate Rainforest and Cool Temperate Mixed Forest given their current limited distribution and listing under FFG.	CTR P1 – Prior to finalising the trail alignment, field surveys are required to identify the extent of Cool Temperate Mixed Forest within the area.	
		CTR P2 – Avoid areas of Cool Temperate Rainforest and Cool Temperate Mixed Forest.	CTR M1 – Minimise the length of the alignment through Cool Temperate Rainforest and Cool Temperate Mixed Forest.
		CTR P3 - No rest stops or viewing areas are to be located within Cool Temperate Rainforest or Cool Temperate Mixed Forest.	

Ecological value	Risk to value	Protocol	Mitigation measures
	The introduction and spread of Myrtle Wilt caused by damage to trees, including disturbance to the root zone will lead to the death of Myrtle Beech species.	CTR P4 – Avoid areas showing signs of Myrtle Wilt.	CTR M2 – Prior to finalising the trail alignment, undertake detailed mapping to clearly identify areas showing signs of Myrtle Wilt (Attach check list of Myrtle Wilt from DELWP as appendix).
		CTR P5 - Avoid the drip line of Myrtle Beech within Cool Temperate Rainforest and Cool Temperate Mixed Forest.	CTR M3 - Where areas containing Myrtle Beech cannot be avoided, minimise disturbance within the drip line of all Myrtle Beech trees using a design/engineered solution. CTR M4 – In the event of any disturbance within the root zone or to any part of Myrtle Beech trees occurs, fungicide must be immediately applied to prevent the spread of Myrtle Wilt.
	The introduction of imported fill material will introduce pathogens and damage the integrity of Cool Temperate Rainforest and Cool Temperate Mixed Forest.	CTR P6 – No imported fill material (including gravel, rock and soil) is to be used within Cool Temperate Rainforest or Cool Temperate Mixed Forest.	CTR M5 – Where soils are damp and boggy, trail must be elevated using boardwalk or another appropriate engineered/design solution.
	Any change to the surface hydrology will have a negative impact on the ecosystem.	CTR P7 – No excavation is to be undertaken within Cool Temperate Rainforest or Cool Temperate Mixed Forest to avoid changes to existing ground surface gradients.	CTR M6 –Trail construction is to be undertaken using hand tools only within Cool Temperate Rainforest and Cool Temperate Mixed Forest.
		CTR P8 – Avoid artificial changes to natural gradients to reduce changes to surface hydrology.	CTR M7 – A trail design approved by a suitably qualified professional should be used to reduce the potential for soil compaction and other impacts to surface hydrology over time.

Ecological value	Risk to value	Protocol	Mitigation measures
Native Fauna	Construction and ongoing use of the trail (including night-time use) will interfere with the existing movement corridors of native fauna, including significant and listed species, which may cause displacement, impact available food sources and reduce available habitat areas.	NF P1 – Avoid all areas which are known or likely to contain significant native fauna as identified in appendix 2.	NF M1 – Apply an appropriate buffer to identified nesting sites of significant native fauna identified in appendix 2, including applying a 5m buffer to rocky outcrops with cracks and crevices. NF M2 – Apply a 20m buffer to lyrebird display mounds.
		NF P2 – Existing habitat trees (>40cm DBH, or hollow bearing trees) are to be avoided.	NF M3 – Apply a 50m buffer to owl nesting sites. NF M4 – Apply an appropriate buffer/visual buffer to all tree hollows.
		NF P3 – Avoid known or probable nesting sites of VBA listed species by at least 10m.	NF M5 – Apply an appropriate buffer to identified nesting sites of significant native fauna identified in appendix 2, including applying a 5m buffer to rocky outcrops with cracks and crevices.
Leadbeater's Possum (LBP)	There are 3 essential components to Leadbeater's habitat which are, an appropriate food source, access to nesting hollows and dense connected vegetation to allow movement. Any impact to one of these factors will have a negative impact on the population and future viability of Leadbeater's in these areas.	LBP P1 – Avoid areas of known and potential LBP habitat. LBP P2 – Apply a 50m buffer zone around known or potential Leadbeater's colonies.	LBP M1 - No removal of dense stands of Callistemon or Tea Tree species within potential or suitable habitat for Leadbeater's possums.

Ecological value	Risk to value	Protocol	Mitigation measures
	Creation of the trail in close proximity to Leadbeater's habitat will facilitate movement by predatory species such as foxes and cats which will increase predation and reduce population size.	LBP P3 – No removal of vegetation within potential or suitable Leadbeater's habitat.	LBP M2 - Where removal of vegetation cannot be avoided, the alignment must utilise existing cleared areas.
	Removal of dense stands of mid-story vegetation, specifically Callistemon and Tea Tree species will negatively impact the movement and therefore health of Leadbeater's populations.		
	Disturbance to existing Australia National University monitoring plots will impact long term monitoring results of Leadbeater's Possum.	LBP P4 – Apply a 200m exclusion zone from the centre of all ANU monitoring plots.	
	The construction and ongoing use of the trail may create disturbance to Leadbeater's and increase the likelihood of human interaction and interference.	LBP P5 - No rest stops or viewing areas within 200m of LBP nest boxes or known or potential colonies.	LBP M3 – The alignment of the trail cannot result in increased visibility to existing nest boxes or occupied tree hollows.

Ecological value	Risk to value	Protocol	Mitigation measures
Mount Donna Buang Wingless Stonefly (SF)	Any disturbance to known and potential habitat of Mt Donna Buang Wingless Stonefly will result in a reduction in the current population and future viability of the species.	SF P1 – Avoid areas of known and potential habitat for Mt Donna Buang Wingless Stonefly.	SF M1 – Align trail as close as possible to the verge of Mt Donna Buang Road or use existing tracks.
	Ground disturbance in close proximity to surface water flowing into Wingless Stonefly habitat will negatively impact available habitat through sedimentation, water pollution, obstructions in waterways and shading of waterways.	SF P2 – No loss of connectivity or change in hydrology patterns in known or potential habitat.	SF M2 - Any work within the potential range of the species must minimise habitat disturbance and sedimentation by elevating the trail to cross waterways, bogs, damp areas or seasonal drainage lines within the mapped suitable habitat zone.
		SF P3 – No increase in sediment transport in identified areas of known or potential habitat.	
		SP P4 – No change in solar radiation (i.e. natural light) in identified areas of known or potential habitat. SF P5 – No ground disturbance or soil compaction within 30m of known or potential habitat.	SF M3 – Any elevated trail must be constructed to minimise ground disturbance and maintain natural light levels.
	Construction during the critical life cycle stages of Wingless Stonefly will negatively impact the species.	SF P6 – Construction of the trail is to be undertaken between December and February.	
Water Quality (WQ)	Trail construction and ongoing use will create sedimentation, contribute to pollution in waterways and facilitate increases in weed distribution.	WQ P1 - Apply Water Act definition to determine presence and extent of waterways – i.e. natural channel where water regularly flows whether or not the flow is continuous or lake, lagoon, swamp or marsh. (Vegetation class can be a good indicator of presence and extent of water on site and thus	

Ecological value	Risk to value	Protocol	Mitigation measures
		whether waterway exists or not.)	
		WQ P2 – Minimise the number of water crossings.	WQ M1 - Where waterway crossing is required, identify the narrowest practicable location. WQ M2 - All waterway crossings are to be elevated (no rock armouring, no wheels crossing through the flow path).
		WQ P3 – Apply a 20m streamside buffer to minor waterways (<60ha catchment).	
		WQ P4 – Apply a 30m streamside buffer for larger waterways (>60ha catchment)	
		WQ P5 – No trails within Coranderrk Creek water supply drinking catchment.	
		WQ P6 - Implement Melbourne Water requirements for works on waterways and crossings.	
		WQ P7 – No ford crossings through waterway flow paths.	

Ecological value	Risk to value	Protocol	Mitigation measures
		WQ P8 - No creation of fish barriers in any waterways that support, or could support, native fish.	WQ M3 – Span bridges are to be used in preference to culverts wherever practical.
		WQ P9 - Avoid areas of wet or boggy ground, including areas where vegetation changes suggest such conditions may be present (i.e. sedges, rushes, mosses etc.).	WQ M4 – Where wet or boggy ground is present, use suitable rock armouring to harden and reinforce the trail
Hydrological Values	Any interruption to the existing surface flows on the southern face of Mt Donna Buang will impact ecosystem health.	HV P1 – Avoid changes to surface water flows.	HV M1 – Minimise alignment through steep slopes to reduce the amount of excavation in National Park.

ABOUT US

WSP is one of the world's leading engineering professional services consulting firms. We are dedicated to our local communities and propelled by international brainpower. We are technical experts and strategic advisors including engineers, technicians, scientists, planners, surveyors, environmental specialists, as well as other design, program and construction management professionals. We design lasting Property & Buildings, Transportation & Infrastructure, Resources (including Mining and Industry), Water, Power and Environmental solutions, as well as provide project delivery and strategic consulting services. With approximately 48,000 talented people globally, we engineer projects that will help societies grow for lifetimes to come.

